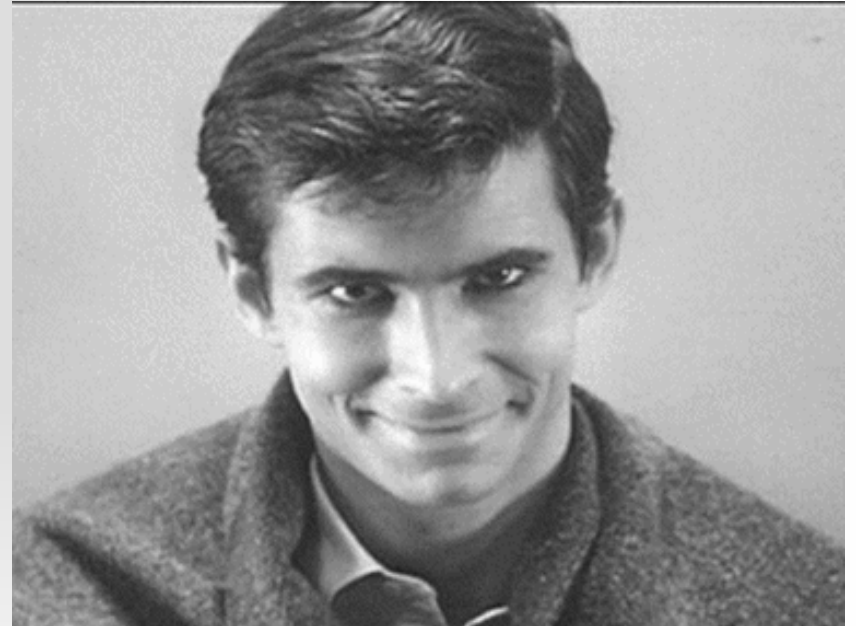


Nnaturally **O**ccurring **R**adioactive **M**aterial



Bureau of Air and Radiation

The Faces of NORM

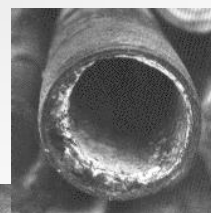
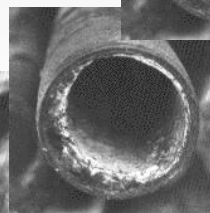
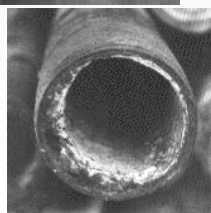
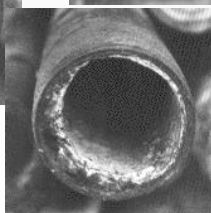
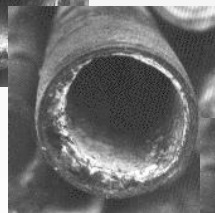
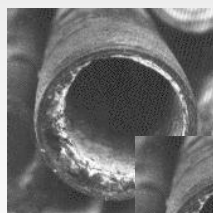
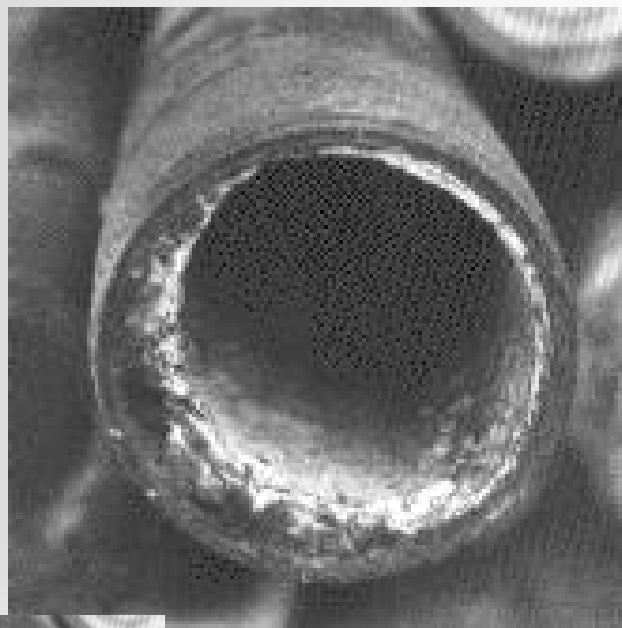


Faces of NORM



Norm Cash
Detroit Tigers





Introduction

- **Naturally Occurring Radioactive Material**
 - NORM
- **Technologically Enhanced**
 - TENORM
- **Naturally Occurring and Accelerator Produced Radioactive Material**
 - NARM



Regulatory Impact

- **Proposed NRC Rulemaking**
 - <http://nrc-stp.ornl.gov/asletters/other/sp06068.pdf>
 - **New definition of byproduct material**
 - Accelerator produced material
 - Discrete sources of Ra-226
 - Discrete sources of NORM meeting specific criteria



Impact on State Regulations

- **Kansas is an Agreement State**
 - NORM is not specifically addressed
 - Each case would qualify based on regulatory limits of radionuclides present
- **Review under way to ensure compatibility with proposed Federal Regulations**



NORM in Kansas

- Oil and gas
 - Rejected shipments at recycling facilities



NORM in Kansas

- Oil and gas
 - Used pipe



NORM in Kansas

- **How pipe becomes radiation concern**
 - **Salt water forms scale in piping**
 - **Barite, barium sulfate present in oil deposits**
 - **Barite incorporates radium**
 - **Used piping sold for inexpensive fencing**
 - **Old fence taken to scrap yard**
 - **Radiation alarms sound at scrap yard**
 - **Pipe is rejected**



NORM in Kansas

- **Scrap yard contacts KDHE Radiation Control Program**
- **KDHE transmits USDOT transportation exemption to scrap yard via facsimile**
 - **Exemption allows direct transport back to origin of shipment**
 - **KDHE follows up with origin site regarding disposition of material**
 - **Normally segregated and stored on-site**



Accumulation of NORM

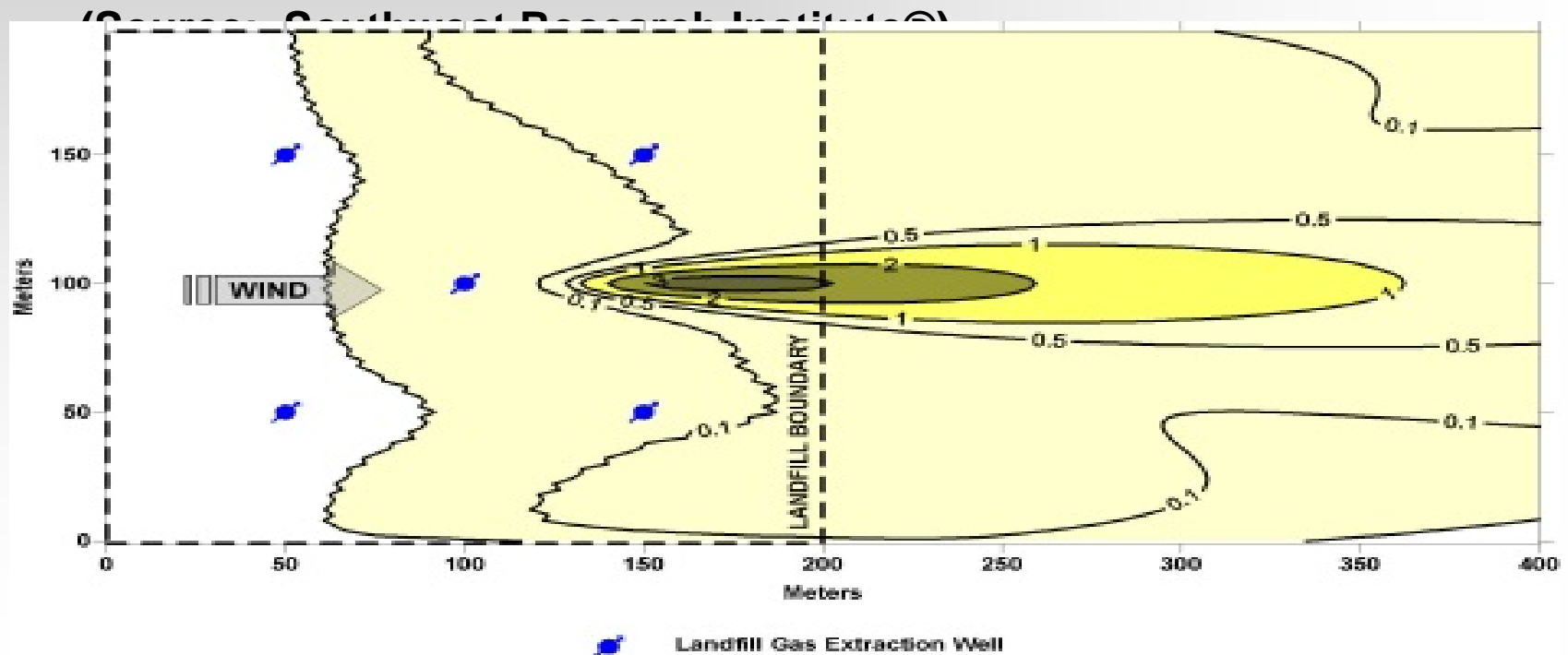
- Pipe cleaning operations
- Levels of concern can be achieved



- **Oil and gas**
 - **Radioactive oil field equipment**
 - **(USGS Fact Sheet FS-142-99 September 1999)**

Landfill Data

- Atmospheric radon plume from landfill gas venting from buried radium-bearing waste



Radium

- Uptake in plants



**Autoradiograph of plant material containing
radioactive isotopes**

(Source: Southwest Research Institute®)



NORM in Kansas

- Mining

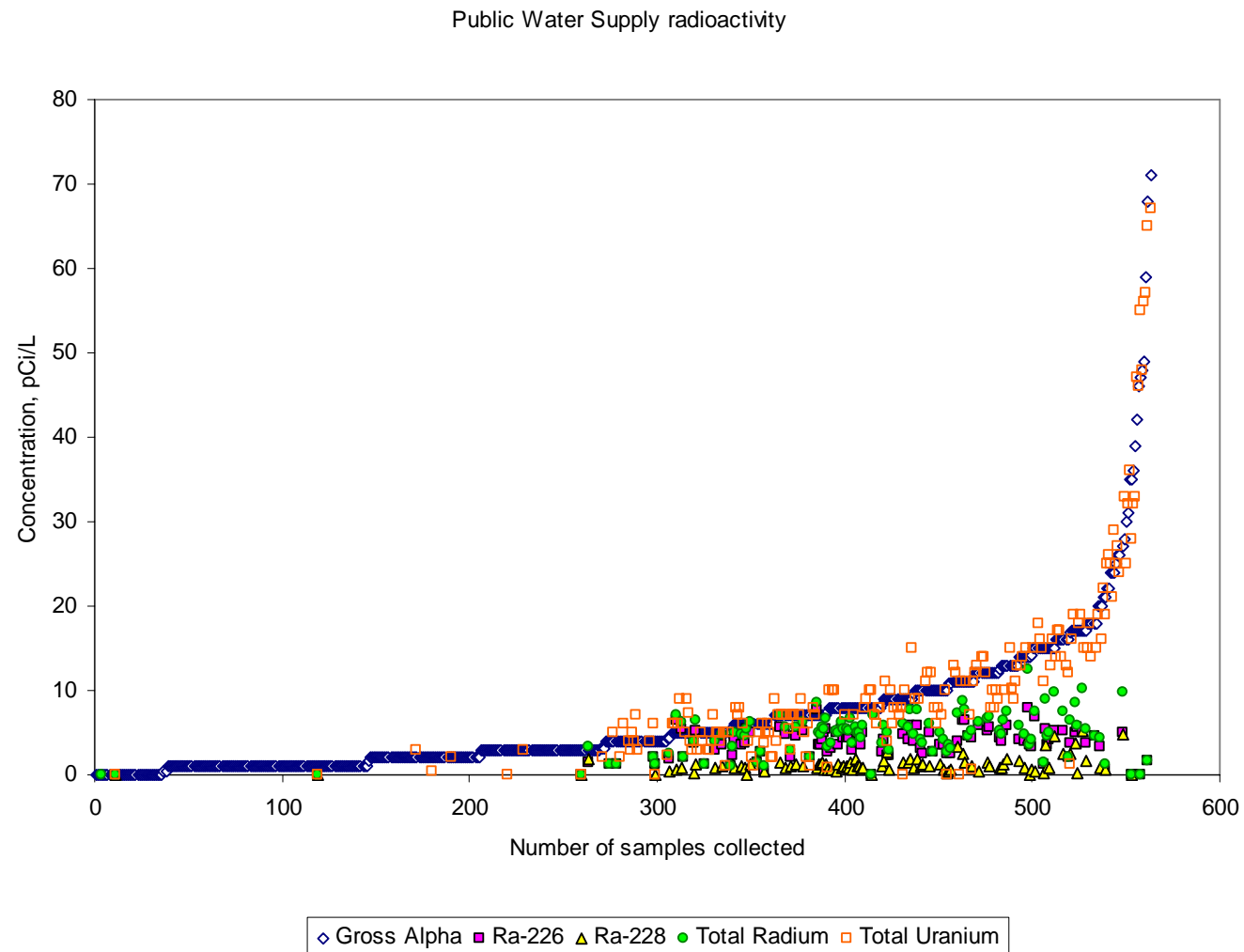


NORM in Kansas

- **Water Treatment**

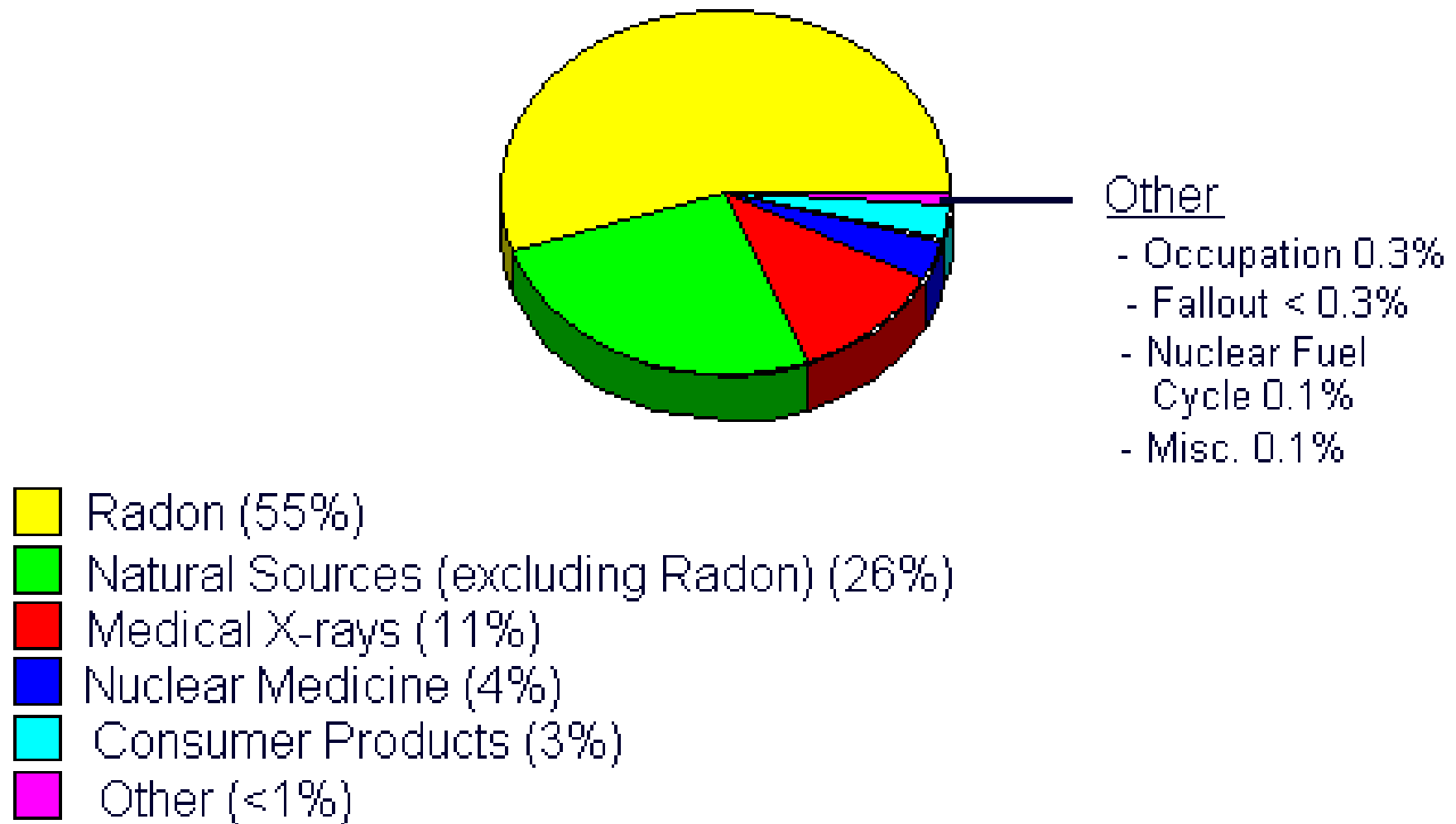


Public Water Supplies



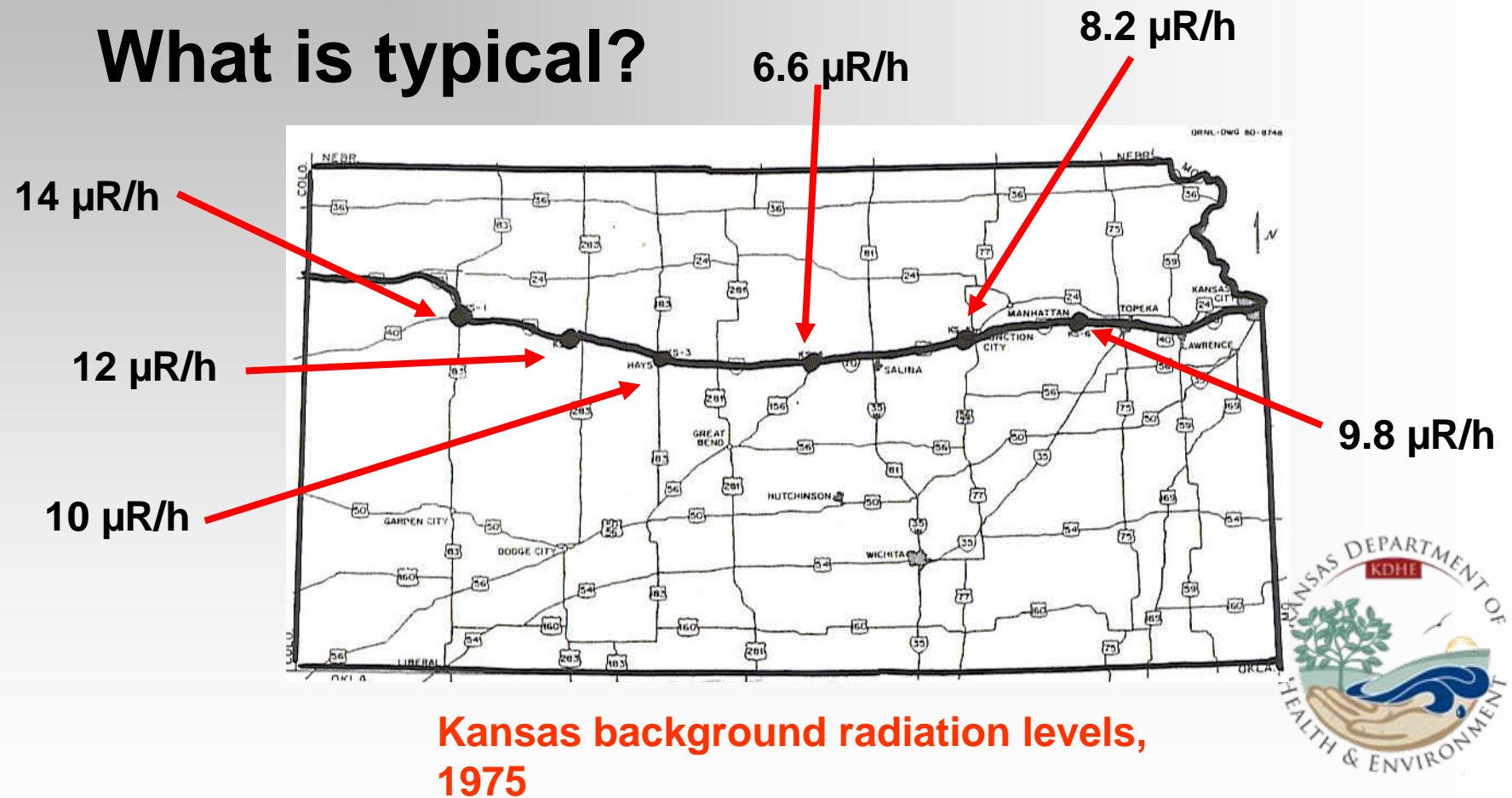
Sources of Radiation Exposure

From: NCRP Report No. 93



Background Levels

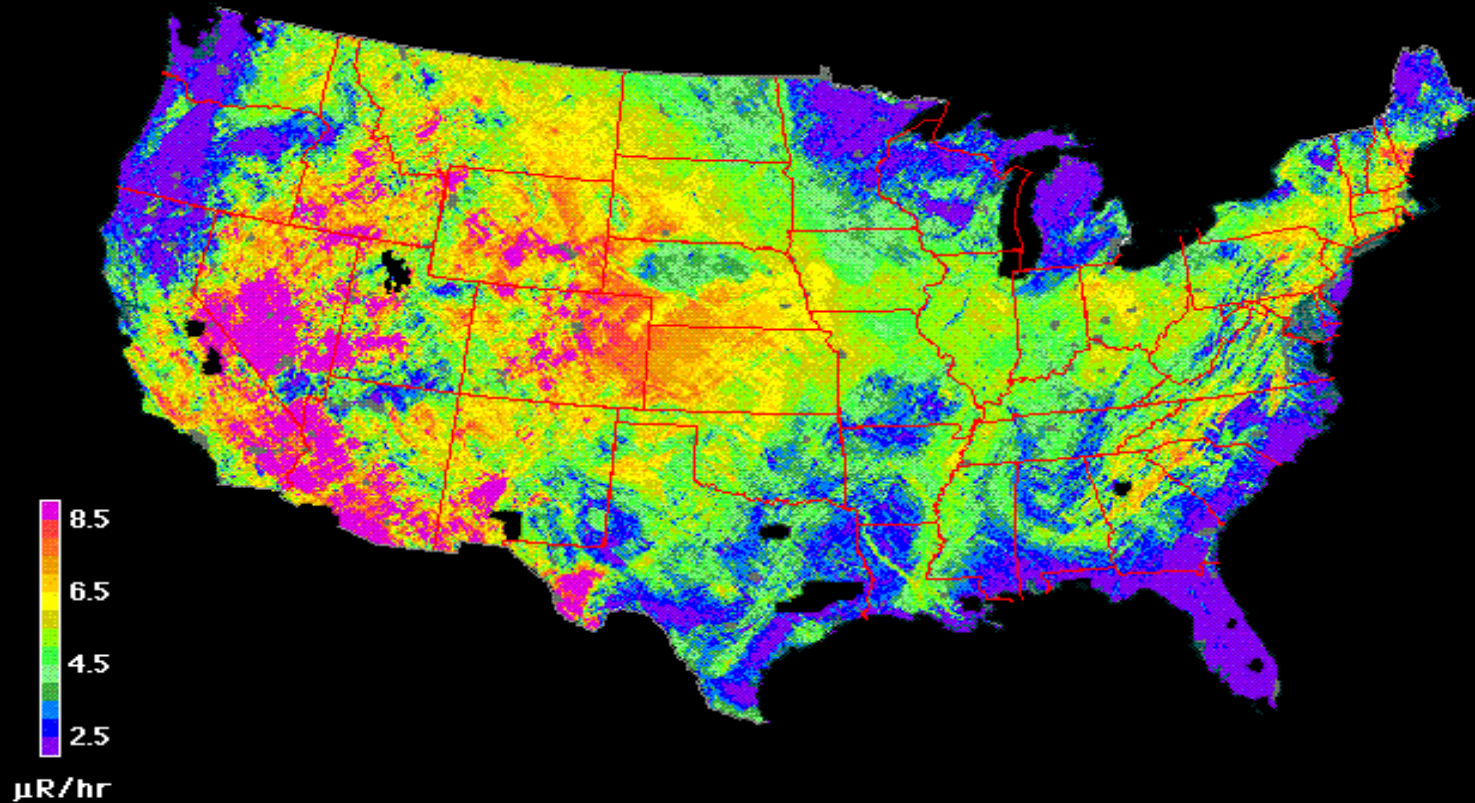
What is typical?



Source: T.E. Myrick, B.A. Breven, F.F. Haywood ORNL/TM-7343, November 1981

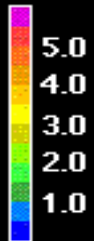
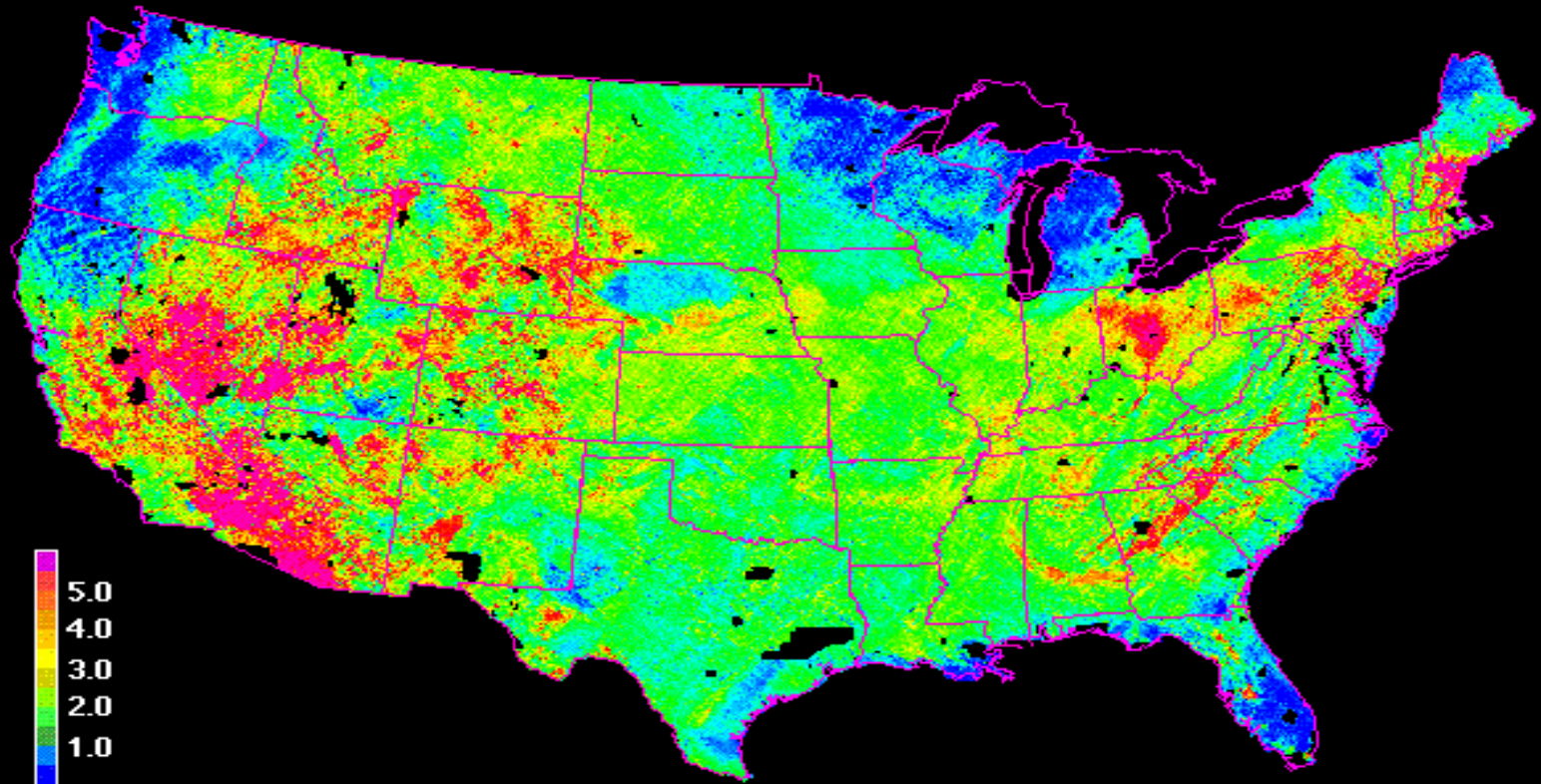
Background Radiation

Terrestrial Gamma-Ray Exposure at 1m above ground



Source of data: U.S. Geological Survey Digital Data Series DDS-9, 1993

Uranium Concentrations

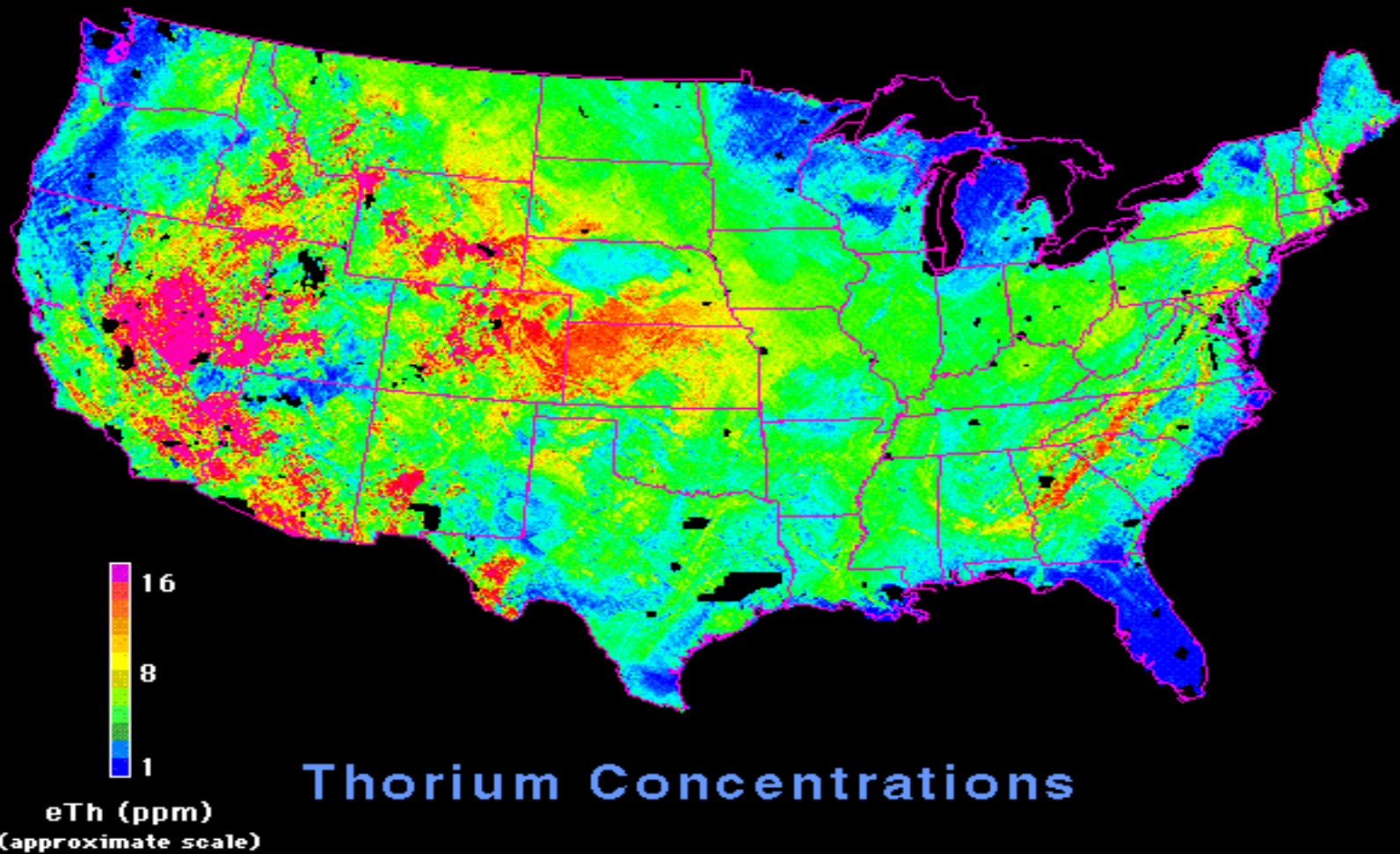


ppm eU
(approximate scale)

Uranium Concentrations

Source of data: U.S. Geological Survey Digital Data Series DDS-9, 1993

Thorium Concentrations



Source of data: U.S. Geological Survey Digital Data Series DDS-9, 1993

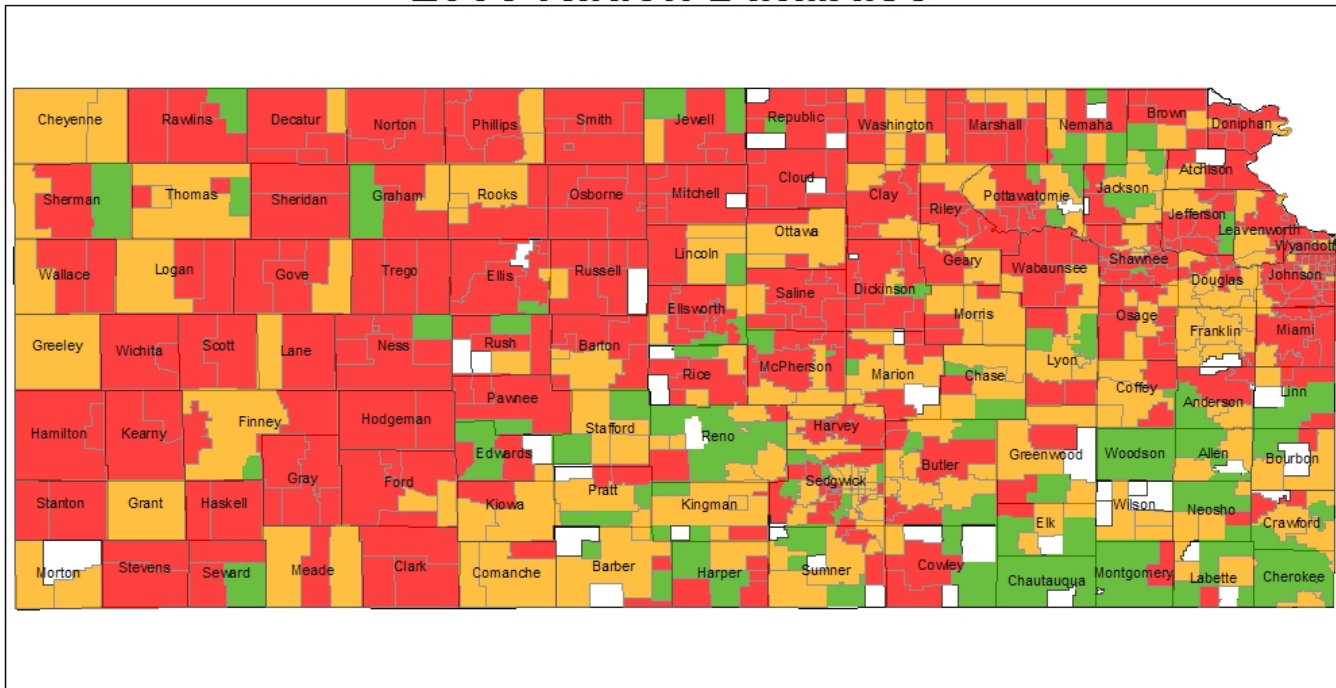
NORM Levels

- **Levels of Concern**
 - **Gamma exposure rate:**
 - 25 $\mu\text{R/h}$ greater than background
 - **Concentration Limit in Soil**
 - 5 pCi/g to 30 pCi/g depending on radon emanation rate, rate of less than 20 pCi/m²s can use the upper soil limit
 - **Loose Surface Contamination**
 - 100 cpm greater than background



Radon Gas is Everywhere

Composite Radon Levels by Kansas County 2005 Radon Database



Copyright 2004 Kansas Department of Health & Environment, K-State University
Caution: This map has been produced from results of a limited statewide indoor radon survey completed by KDHE in 1998 and other data subsequently obtained. This map is provided for informational purposes only. As better data becomes available, revisions will be necessary. Because of the limited available data, the map cannot be used for characterizing or predicting radon levels in specific areas or locations. Appropriate measurement must be performed to determine the radon levels in any given building or residence. For advice contact the Kansas Radon Program at (800) 650-2342. Permission is hereby given to reproduce the map provided it is reproduced in its entirety without modification.

Total Number of Measurements = 31,084
Average Radon Level = 4.6
Maximum Radon Level = 204.4
Total Readings 4 pCi/L or above = 12,204

Average Radon by Zip Code

ks zip
 2005_June_Update.AVGRAD
 No Data
 0.1-1.9 pCi/L
 2.0 - 3.9 pCi/L
 4.0 or greater pCi/L

39% of homes tested in Kansas exceed EPA recommended action level of 4.0 pCi/L



Kansas Radon Program

<http://radon.oznet.ksu.edu>

Kansas Radon Hotline 1-800-693-5343

Do you have a radon problem?



- What are the risks?
- Testing is easy.
- Inexpensive test kits are available at your county extension office.
- A radon mitigation system will fix your home.
- Radon resistant homes can be built.

KSTATE
Kansas State University



- Test your home for radon
- Contact Kansas Radon Program for more information



Questions

